NOTICE!

ALL DRAWINGS
ARE LOCATED
AT THE END OF
THE DOCUMENT

DRAFT

PLUTONIUM IN SOILS TREATABILITY STUDIES WORK PLANS
TRUclean PROCESS AND MAGNETIC SEPARATION

ROCKY FLATS PLANT
OPERABLE UNIT 2

U S DEPARTMENT OF ENERGY
ROCKY FLATS PLANT
GOLDEN COLORADO

ENVIRONMENTAL RESTORATION PROGRAM

NOVEMBER 14 1991

VOLUME II

DRAFT

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VOLUME II

PLUTONIUM IN SOILS TREATABILITY STUDIES WORKPLAN

VOLUME II

FIELD SAMPLING PLAN

FOR THE

PLUTONIUM IN SOILS TREATABILITY STUDY

(OPERABLE UNIT NO. 2)

U S. DEPARTMENT OF ENERGY

ROCKY FLATS PLANT

GOLDEN, COLORADO

DRAFT

Title **Plutonium in Soils** **Treatability Studies Workplan** **Field Sampling Plan**	**Approved by** _____ ___/___/___ **Manager, Remediation Programs** **Date**

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FIGURES

LIST OF ACRONYMS

cm	centimeter
cpm	centimeter per minute
FIDLER	Field Instrument for Detection of Low Energy Radiation
GOCO	government-owned, contractor-operated
IHSS	Individual Hazardous Substance Sites
NTS	Nevado Test Site
OP	Operating Procedures
OU2	Operable Unit 2
pCi/g	picocuries per gram
PSCID	Plutonium in Soils Cleanup Integrated Demonstration
PU	plutonium
RFP	Rocky Flats Plant
TAL	Target Analyte List
USDA	U S Department of Agriculture

1 0 INTRODUCTION

This Field Sampling Plan for sampling plutonium (Pu) contaminated soils from Operable Unit 2 (OU 2) at the Rocky Flats Plant (RFP) describes the sampling objectives, the location and the number of samples to be collected, the chemical and physical parameters to be analyzed, and references the procedures for collecting the samples

The objective of sampling Pu-contaminated soils from OU 2 is to provide data for the treatability study to be performed during the Plutonium in Soils Cleanup Integrated Demonstration (PSCID) The PSCID is being hosted by the Nevada Test Site (NTS) to evaluate gravimetric separation (physical separation/soil washing) and other potential treatments for removing plutonium/americium in soils A bulk soil sample will be collected from each of the locations and transported to NTS for characterization and testing of the selected processes

Four sampling locations have been selected based on soil type and expected Pu concentration The samples will be collected from the most common types of soil present at OU 2 as described and mapped by the U S Department of Agriculture (USDA) Expected Pu concentrations have been estimated based on analytical results obtained during past soil sampling east of the 903 Pad area A bulk composite sample will be collected from each of the sample locations A subsample of the bulk sample will be analyzed for various physical and chemical parameters

2 0 SITE BACKGROUND

RFP is located in northern Jefferson County, Colorado, approximately 16 miles northwest of downtown Denver (Figure 1) The plant site consists of approximately 6,550 acres of federally-owned land in Sections 1 through 4, and 9 through 15, of T2S, R70W, 6th principal meridian Plant buildings are located within a 400-acre area known as the RFP security area The security area is surrounded by a buffer zone of approximately 6,150 acres

RFP is a government-owned, contractor-operated (GOCO) facility It is part of a nationwide nuclear weapons research, development, and production complex administered by the Department of Energy -- Rocky Flats Office The operating contractor for RFP is EG&G Rocky Flats, Inc The facility manufactures

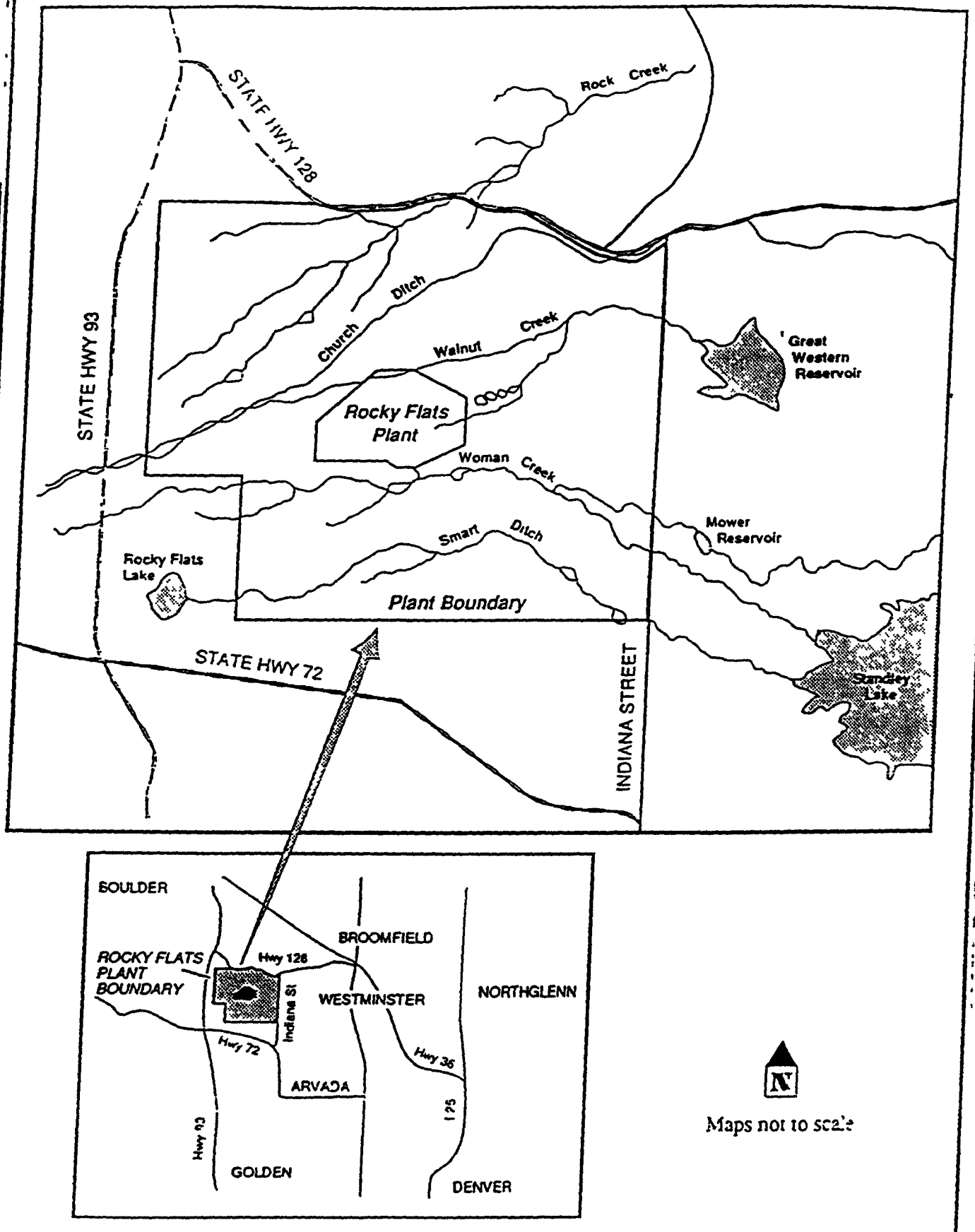

FIGURE 1 Location Map of Rocky Flats Plant

components for nuclear weapons and has been in operation since 1951 Historically, production activities have included metal fabrication, machining, and assembly Both radioactive and nonradioactive wastes are generated in the process Current waste handling practices involve onsite and offsite recycling of hazardous materials and onsite storage of solid radioactive materials

RFP is currently an interim status RCRA hazardous waste treatment/storage facility In the past, both storage and disposal of hazardous and radioactive wastes occurred onsite Preliminary assessments conducted under Phase 1 of the Environmental Restoration Program identified some of the past onsite storage and disposal locations as potential sources of environmental contamination (EG&G, 1989)

2 1 Operable Unit 2

There are 20 sites designated as Individual Hazardous Substance Sites (IHSSs) that comprise the 903 Pad, Mound, and East Trenches Area These sites are known collectively as OU 2 and are located east-southeast of RFP security area (Figure 2)

The 903 Drum Storage Site (903 Pad) (IHSS No 112) was used from 1958 to 1967 to store drums containing mixed waste The drums, some of which corroded and leaked, contained oils and solvents contaminated with Pu or uranium

During drum removal and cleanup activities associated with the 903 Pad, winds transported Pu to the south and east into the area currently defined as OU 2 The most contaminated area was located south and southeast of the pad This area has been designated as the 903 Lip Site (IHSS No 155) Surveys at the time of the drum removal project and subsequent annual soil sampling from 1969 to 1972 showed a maximum Pu concentration of 2,258 picocuries per gram (pCi/g) in the top 5 centimeters (cm) of soil at the 903 Lip Site (EG&G, 1989)

Soil cleanup efforts were undertaken in 1976, 1978, and 1984 to remove Pu-contaminated soils from the 903 Lip Site The 1976 soil removal consisted of hand-excavating contaminated soils until the contamination levels were below the lower detection limit of the Field Instrument for Detection of Low-Energy Radiation (FIDLER) The lower detection limit of FIDLER is 250 counts per minute (cpm) The excavated area was covered with clean topsoil and reseeded with native grasses

During the 1978 soil removal project, all soil that exceeded 2,000 cpm, as determined with FIDLER, was removed The excavated areas were resurveyed with FIDLER, and soil removal continued until background readings (approximately 250 cpm) were obtained Topsoil was added to the excavated areas, and the site was reseeded with native grasses

A third soil removal effort was performed during 1984 An area along the eastern edge of the 903 Lip Site was excavated and backfilled with clean topsoil

3 0 SAMPLING PROGRAM

Four soil sampling locations have been selected in OU 2 east of the 903 Pad (Figure 3) The locations were selected based on soil type and expected Pu concentrations The two soil types to be sampled have been classified as soil type 31-Denver-Kutch-Midway clay loams, and soil type 45-Flatirons very cobbly sandy loam (USDA, 1980) (Figure 4) Expected concentrations of Pu range from approximately less than 10 pCi/g at the extreme eastern locations, to approximately 500 pCi/g in the soils at the location southeast of the 903 Pad

At each location, a bulk composite sample will be collected using a stainless-steel shovel The sampling procedures will follow procedures specified in a procedure change notice to EG&G Environmental Restoration Standard Operating Procedure GT 08 The procedure change notice addresses specific sampling procedures to be used to support treatability studies at Nevada Tests Site and the Los Alamos National Laboratory The sampling procedure will result in a bulk sample of approximately 1660 kilograms (3660 lbs) that will be divided between Nevada Test Site (87 5%), Los Alamos National Laboratory (6 25%), and Rocky Flats Plant (6 25%) A subsample of the RFP sample will be obtained for analyses of physical parameters EG&G will perform an onsite radiological activity screening of the samples before the samples are shipped offsite

The RFP subsample collected for analysis of chemical parameters will be split and transferred to appropriate containers A portion of the composite sample will be analyzed for Target Analyte List (TAL) metals using EPA Method 6010, volatile organic compounds using EPA Method 8240, and semi-volatile

organic compounds using EPA Method 8250 A portion of the composite sample will be containerized and analyzed for Total Radionuclides, including ^{239}Pu, ^{240}Pu, ^{238}Pu, ^{241}Am, ^{233}U, ^{234}U, ^{235}U, ^{238}U, gross alpha, and gross beta

4 0 SAMPLING PROCEDURES

Sampling procedures will follow those specified in the procedure change notice to ER OP GT 08 The specifics of the sampling procedures are detailed in Volume I of the Plutonium in Soils Treatability Studies Workplan All field work will be performed in accordance with the health and safety plan developed for this task The health and safety plan is included in Section 2 0 of Volume II

Samples will be collected using stainless-steel shovels and will be limited to A-horizon material The sampling will be conducted in a manner that minimizes impact to the surrounding vegetation Sampling will continue until the neccessary volume of soil has been obtained Sampling and decontamination procedures will follow guidelines presented in RFP EG&G Operating Procedures (OPs) FO 3-- General Equipment Decontamination, FO 13-- Containerization, Preserving, Handling, and Shipping of Soil and Water Samples, FO 16-- Field Radiological Measurements, and GT 08-- Surface Soil Sampling (EG&G, 1990) Any substantial excavation will be backfilled with pea gravel The sample location will be marked with a metal stake in the event that additional sampling is required for the treatability study The project, time, and date will be recorded on a metal tag which will be attached to the stake

Chain-of-custody procedures outlined in EG&G OP FO 13 will be strictly followed Samples will be shipped to NTS in accordance with U S Department of Transportation regulations

5 0 REFERENCES

American Society for Testing and Materials, 1986 Annual Book of ASTM Standards, Section 4 Construction, Volume 04 08 Soil and Rock, Building Stones, March 1986

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Klute, Arnold, Methods of Soil Analysis Part 1, Physical and Mineralogical Methods, Second Edition, Number 9 in the series AGRONOMY, Madison, Wisconsin, 1986

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HEALTH AND SAFETY PLAN

FOR THE

PLUTONIUM IN SOILS TREATABILITY STUDY

(OPERABLE UNIT NO. 2)

U.S DEPARTMENT OF ENERGY

ROCKY FLATS PLANT

GOLDEN, COLORADO

DRAFT

Title
Plutonium in Soils Treatability Studies Health & Safety Plan for Hazardous Waste Site Field Operations

Approved by

_____ ___/___/___
Manager, Remediation Programs **Date**

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FIGURES

LIST OF ACRONYMS

CDH	Colorado Department of Health
CERCLA	Comprehensive Environmental Response Compensation and Recbvery Act
cm	centimeter
cpm	counts per minute
DOE	Department of Energy
EMAD	Environmental Monitoring and Assessment Division
EPA	Environmental Protection Agency
ER	Environmental Restoration
FID	Flame Ionization Detector
FIDLER	Field Instrument for Detection of Low Energy Radiation
FO	Field Operations
H&S	Health and Safety
HAZMAT	Hazardous Materials Agency
HEPA	High Efficiency Particulate Air
HSPP	Health and Safety Program Plan
IHSS	Individual Hazardous Substance Site
mph	miles per hour
NPL	National Priority List
OP	Operating Procedure
OTJ	On the Job
pCi/g	picocuries per gram
ppm	parts per million
PU	Plutonium
RCRA	Resource Conservation and Recovery Act
RFP	Rocky Flats Plant
ROI	Radiological Operating Instructions
RPTs	Radiation Monitor Technician
SCBA	Self Contained Breathing Apparatus
VOCs	Volatile Organic Compounds

A GENERAL SITE INFORMATION

SITE NAME Rocky Flats Plant (RFP)
PROJECT NO 5761 20
PROJECT NAME SOIL SAMPLING AT ROCKY FLATS PLANT FOR THE PLUTONIUM-CONTAMINATED SOILS CLEANUP - INTEGRATED DEMONSTRATION PROGRAM

SITE LOCATION Golden, CO

DATES OF VISIT To be determined

OBJECTIVE

This plan outlines the health and safety protocol to be followed during SOIL SAMPLING AT ROCKY FLATS PLANT FOR THE PLUTONIUM- CONTAMINATED SOILS CLEANUP - INTEGRATED DEMONSTRATION PROGRAM The program consists of the collection of four bulk sample of plutonium (Pu) contaminated surface soils The expected Pu concentration in the soils range from 10 pCi/g to 500 pCi/g The samples will be obtained from four areas located east of the 903 Pad (IHSS 155) The sample locations are plotted on Figure 3 This health and safety plan is a revision of a health and safety plan that was approved by EG&G for a similar sampling task that occurred on October 19, 1990 The task is expected to take up to two week to complete and is scheduled to be performed sometime during 1991 The comments received from the EG&G Health and Safety (H&S) review have been incorporated

ORIGINAL SAFETY PLAN? yes/**no** REVISION NO 2

SITE CONTACT & PHONE NO

R Lindberg 966-5963 - Interim Manager of Soils, Sediments, and Surface Water
I Litaor 966-5970 - Principal Senior Soil Geochemist
O Erlich 273-6110 - Environmental Engineer
D Smith 966-5958 - ER Health and Safety Officer

SITE TYPE

Active Department of Energy (DOE) facility involved in the production of metal components for nuclear weapons
MAP ATTACHED? yes

SITE HISTORY

RFP is a government-owned contractor-operated facility EG&G is the present primary operating contractor The plant has been in operation since 1952 It is involved in manufacture of the "pit assembly" plutonium component of nuclear weapons, reprocessing scrap and plutonium from dismantled weapons, laboratory research on properties of nuclear materials, and fabrication of other metals such as steel and beryllium

Wastes produced include hazardous wastes, low-level and transuranic radioactive wastes, and mixed wastes Historically, these wastes have been either disposed onsite, stored in containers onsite, or disposed offsite RFP was proposed for inclusion on the Superfund National Priority List (NPL) in 1984 and included on the NPL in the October 4, 1989, Federal Register Cleanup is being conducted under the Response Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response Compensation and Recovery Act (CERCLA) Environmental Protection Agency (EPA), DOE, and Colorado Department of Health (CDH) are involved in assessment and cleanup roles at the plant A draft Interagency Agreement between the three was released for public comment in December 1989 and was produced to clarify the roles and responsibilities of each agency

SITE DESCRIPTION & FEATURES

The plant site covers approximately 6,550 acres in Jefferson County, Colorado, Sections 1 through 4 and 9 through 15 of R70W, T2S The facility is centered at 105 degrees 11 30" west longitude, 39 degrees 53 30" north latitude This location is 16 miles northwest of Denver and 9 to 12 miles from the communities of Boulder, Broomfield, Golden, and Arvada It is approximately bounded on the north by State Highway 128, on the west by State Highway 93, on the south by State Highway 72, and on the east by Jefferson County Highway 17 (Indiana Street) Major plant structures, including all production buildings, are located within a 384-acre security fenced area The plant is divided into several areas constituting separate operational complexes The major production facilities and associated complexes are in the 300, 400, 600, 700, 800, and 900 areas (refer to Figure 1)

The Environmental Monitoring and Assessment Division (EMAD) has requested soil sampling be performed to provide a bulk sample required for the plutonium-contaminated soils cleanup treatability study to be performed under the Integrated Demonstration Program

DESCRIPTION OF SPECIFIC SITE AREA(S) OF CONCERN

The areas to be sampled are plotted on Figure 3 The areas were impacted by wind-born contamination emanating from the 903 Pad drum removal activities The site to be sampled is located east of the 903 Pad (IHSS 155) No ongoing plant activities will impact the sample area The following is a brief discussion of the history of IHSS 155 obtained from the PHASE II RI/FS WORK PLAN ROCKY FLATS PLANT 903 PAD, MOUND, AND EAST TRENCHES AREAS OPERABLE UNIT NO 2, DECEMBER 1989

IHSS 155 903 Lip Site

During drum removal and cleanup activities associated with the 903 Drum Storage Site (903 Pad), winds redistributed plutonium to the south and east The most contaminated area was immediately adjacent to the pad to the south and southeast Surveys at the time of the drum removal project and subsequent annual soil sampling from 1969 to 1972 showed a maximum plutonium concentration of 2,258 pCi/g in the top five centimeters (cm) of soil at the 903 Lip Site

Soil cleanup efforts were undertaken in 1976, 1978, and 1984 to remove plutonium-contaminated soils from the 903 Lip Site The 1976 soil removal consisted of hand-excavating contaminated soils until the

contamination levels were below the lower detection limit of the Field Instrument for Detection of Low-Energy Radiation (FIDLER) The lower detection limit of FIDLER is 250 counts per minute (cpm) The excavated area was covered with clean topsoil and reseeded with native grasses

During the 1978 soil removal project, all soil that exceeded 2000 cpm, as determined with FIDLER, was removed The excavated areas were resurveyed with FIDLER, and soil removal continued until background readings (approximately 250 cpm) were obtained Topsoil was added to the excavated areas, and the site was reseeded with native grasses

A third soil removal effort was performed during 1984 An area along the eastern edge of the 903 Lip Site was excavated and backfilled with clean topsoil

SURROUNDING POPULATION rural / residential / commercial / industrial / other

The Plant is located adjacent to foothills west of Denver Rural areas are located to west, populated areas are located to the east

B HAZARDOUS MATERIALS/WASTE CHARACTERISTICS

MATERIAL TYPE(S)
Liquid __
Solid x
Sludge __
Gas __
Other __

CHARACTERISTICS
Corrosive __
Ignitable __
Radioactive x
Volatile __
Toxic __
Reactive __
Unknown __
Other __

HAZARDOUS MATERIAL SUMMARY

Hazardous Material/Waste	Source/Quantity/Characteristics
Plutonium-contaminated soil	903 Pad/Obtain 4 / 10 - 500 pCi/g bulk samples

C HAZARD EVALUATION

HAZARDS OF CONCERN
Organic Chemicals x
Inorganic Chemicals __
Pesticides/PCBs __
LLW __
TRU __
Biologic x
Slip, trip, fall x
Weather x
Ongoing facility operations in area__
Power lines __
Other x - radiological

Describe ongoing facility operations of concern & any other potential hazards

The sites to be sampled are located in the RFP east buffer zone, no ongoing plant operations will impact

the area

CHEMICAL EXPOSURE HAZARD SUMMARY

TASK HAZARD ASSESSMENT

OVERALL HAZARD High___ Moderate _X_ Low __ Provide rational

The overall exposure hazard is considered to be moderate, as Pu concentrations detected during 1989 sampling in this area ranged from 7 7 to 283 pCi/g The primary hazard associated with this sampling task is the threat of ingestion or inhalation of plutonium-contaminated material This threat will be minimized by utilizing the procedures listed in Section D of this plan

CHEMICAL EXPOSURE HAZARD SUMMARY

Hazardous Material/Waste	Exposure Limit	Potential Pathways of Exposure	Signs or Symptoms of Acute Exposure
Plutonium 239	5 rem/yr ALARA	Inh, Ing, Con	(Personnel continuously monitored with RFP dosimeters)
Plutonium 240	5 rem/yr ALARA	Inh, Ing, Con	(Personnel continuously monitored with RFP dosimeters)
Americium 241	5 rem/yr ALARA	Inh, Ing, Con	(Personnel continously monitored with RFP dosimeters)

D SITE OPERATIONS

TASK 1

Obtain a bulk surface soil sample (0 to 20 cm) from four locations using a shovel or a stainless-steel scoop The site will be monitored with an Foxboro OVA128 by the contractor's field crew prior to and during sampling The Foxboro will be calibrated with methane at 100 ppm in air Volatile organic compounds (VOCs) are not anticipated to be present The use of a Flame Ionization Detector (FID)-type monitor will confirm that VOCs are not present at the sample location The site will be monitored by EG&G or contractor's Radiation Monitor Technicians (RPTs) during sampling Copies of H&S equipment calibration and data obtained during the sampling task will be made available to EG&G H&S personnel

Level of protection A__ B__ C_X_ D__

Schedule To be determined

PROTECTIVE EQUIPMENT (specify probable quantity required, N/A = not applicable)

Respiratory N/A__

___ SCBA, Airline
__x_Full Face Respirator
HEPA/ACTIVATED CARBON cartridge
___Escape Mask
___None
___Other____

Clothing N/A__

____Fully Encapsulating Suit
____Chemically Resistant Splash Suit
____Apron, Specify_____
__x_Tyvek Coverall
____Saranex Coverall
__x Cotton Coverall to be worn under the tyvek
____Other

Head and Eye N/A__

_x_Hard Hat around overhead hazards
___Goggles
___Face Shield
___Chemical Eyeglasses

___None
_x_Other_Safety Glasses with side shields

Hand Protection N/A___

_x_Gloves
(Type)see below
_x_Undergloves
(Type) Latex
_x_Overgloves
(Type) nitrile
___Other_____

Foot Protection N/A___

_x_Safety Boots
_x_Latex Disposable Overboots
____Other_____

MONITORING EQUIPMENT

___CGI
___PID
_x_FID - action level is 2 5 ppm sustained above background for volatile compounds - If a sustained reading of 2 5 ppm is measured in the breathing zone of the worker, full-face respirators with appropriate cartridges will be donned
___O_2 Meter
_x_Rad Survey provided by RFP or Contractor RPTs following ROI 2 1, 2 3, 3 1, 3 2 procedures RPTs will monitor the site prior to sampling activities and when the workers are leaving the sample location
_x_Other External Dosimetry, Fecal and urine bioassays
___Detector Tubes
___Type
_x_Other RPTs will utilize EBERLINE SAC-4, LUDLUM -12-1A, LUDLUM-31 monitors

SITE ACCESS/CONTROL

R Lindberg 966-5963 - Interim Manager of Soils, Sediments, and Surface Water
I Litaor 966-5970 - Principal Senior Soil Geochemist
O Erlich 273-6110 - Environmental Engineer
D Smith 966-5958 - Environmental Restoration (ER) Health and Safety Officer

DECONTAMINATION PROCEDURES

TASK 1

An exclusion zone for decontamination activities will be delineated by four traffic cones adjacent to the sample location The decontamination area within the exclusion zone will consist of plastic set on the ground with two tubs, two scrub brushes, and two sprayers set on the plastic One sprayer will be filled with a non-phosphate detergent and distilled water, the other sprayer will contain distilled water Prior to leaving the sampling area, all personnel will be required to decontaminate themselves by the following process All personal equipment contacting soil will be scrubbed with a non-phosphate detergent wash followed by a thorough distilled water rinse Personnel will perform a field hand wash with distilled water at the work area Personnel will be monitored by a RPT following procedures ROI 2 1, 3 1, and 3 2, prior to leaving the work area Personnel determined to be contaminated by the RPT will be handled following procedure ROI 2 3, to be followed by a bioassey Personnel determined not to be contaminated will take a total body shower at Building T764A

WORK LIMITATIONS

1 Heat stress limitations per the RFP HSPP will be imposed If the ambient temerature is greater than 70° F, work will be performed in 30-minute intervals with 15-minute rest periods between work intervals

2 Work will be stopped if winds exceed 15 mph for two consecutive 15-minute intervals Radio communication will be maintained between site workers and the EG&G construction manager, who will inform the workers of wind speeds

3 The soil will be wetted with distilled water to minimize the potential for resuspension prior to sampling

4 The full-face respirators will be donned when intrusive activities (actual sampling) occur

INVESTIGATION DERIVED MATERIAL DISPOSAL

All solids collected will be kept as samples Decon water will be containerized and transported to the decon pad located at the EG&G 800 Area Contractor's Lot per ER OP FO 6 Protective clothing and disposables will be bagged and transported to the contractor trailer area for proper RFP onsite disposal per ER OP FO 7 The samples will be radiologically screened by RPTs prior to offsite transport

ADDITIONAL NOTATIONS None

E SITE PERSONNEL

	Name	Medical Current	40 hr Training	24 hr OTJ Training	Fit Test Current	CPR/ First Aid	Cert * Level	Supervisor Training
Project Manager	Craig C Allen	Y	Y	Y	Y	Y	B	Y
Field Team Leader	Craig C Allen	Y	Y	Y	Y	Y	B	Y
H&S Officer	Steve Brown	Y	Y	Y	Y	Y	B	Y
Field Staff	Steve Brown	Y	Y	Y	Y	Y	B	Y
	John Boylan	Y	Y	Y	Y	Y	C	N
	Dan Reeder	Y	Y	Y	Y	Y	C	N

*Note Certification level refers to the maximum level of protection as described by OSHA 1910 120 that personnel are qualified by training and experience to wear

SITE-SPECIFIC TRAINING AND MEDICAL MONITORING REQUIREMENTS RFP courses Rad Safety (476) Industrial Safety (429), RCRA (435), Respirator Indoctrination (284), Respirator Fit Test All training records and medical fitness records are on file at the Stoller office and the RFP Stoller Field Trailer located at the EG&G 800 Area Construction Lot Fecal and urine bioassays are required for this sampling effort

F EMERGENCY INFORMATION

SITE RESOURCES

Medical Clinic	x	
HAZMAT Team	x	
Phone	x	
2-Way Radio	x	channel 1 for RFP emergency response
Water Supply	x	
Restrooms	x	
Fire Department	x	
Police	x	

Emergency Phone Numbers (If onsite emergency assistance available, please list site numbers)

The nearest phone is located at the Stoller field trailer The field crew will be in radio communication with the Stoller site supervisor at the Stoller trailer

Ambulance	2911
Medical	2911
Fire	2911
Police	2911
Poison Control Center	2911 (Onsite contact)
Other	
Project Manager	449-7220
Site Contact	273-6110
H & S Coordinator	447-5940

Ambulance	2911
Medical	2911
Fire	2911
Police	2911
Poison Control Center	2911
Other	
Project Manager	449-7220
Site Contact	966-5958
H & S Coordinator	449-7220

CONTINGENCY PLANS

Spill, Accidental Release Call 2911

Fire, Explosion Call 2911 or use fire alarm or fire phone

Other Evacuate area if in immediate danger

EMERGENCY ROUTE TO NEAREST HOSPITAL (attach map) Onsite medical facility - Bldg 122 (See Fig 2)

EVACUATION PROCEDURES

Follow instructions given over public address system, otherwise upwind

G PLAN APPROVAL

Plan Prepared By Craig C Allen

Health & Safety Coordinator E Stephen Brown

Project Manager Craig C Allen

PROJECT NO 5761 20

H EMPLOYEE CERTIFICATION

I certify that have read, understand and agree with the contents of this Health and Safety Plan

Name _____

Date _____

Name _____

Date _____

Name _____

Date _____

Name _____

Date _____

Name _____

Date _____

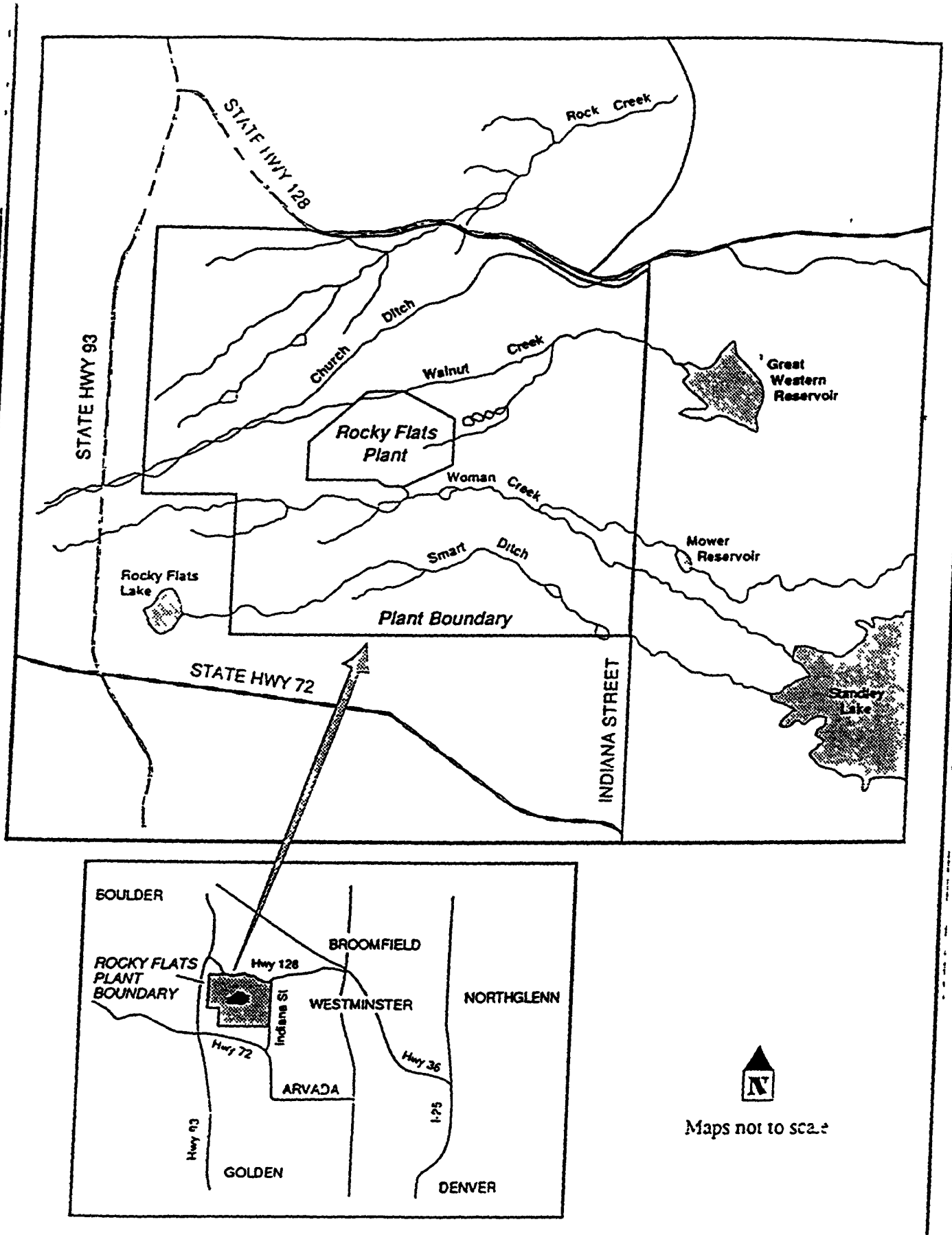
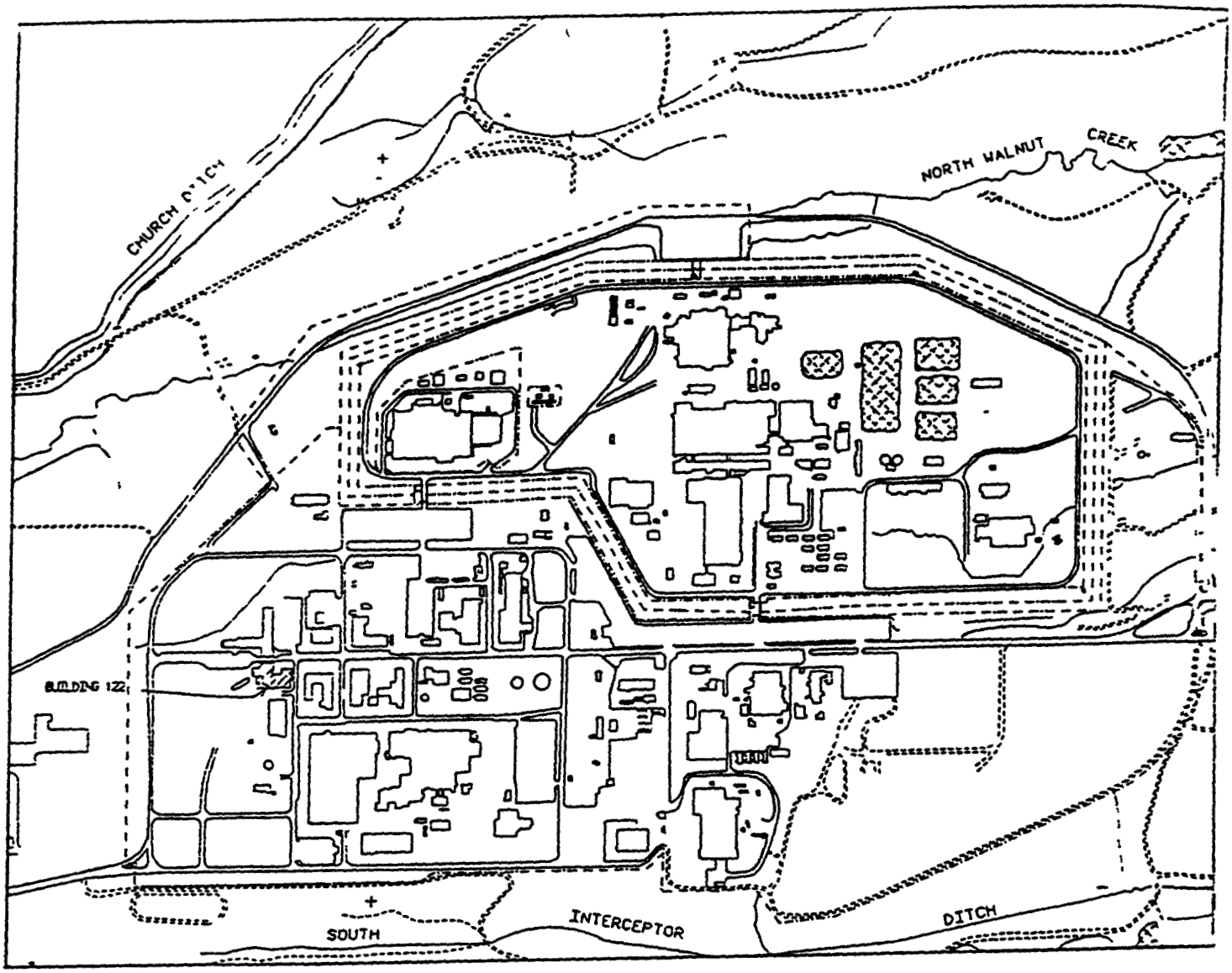
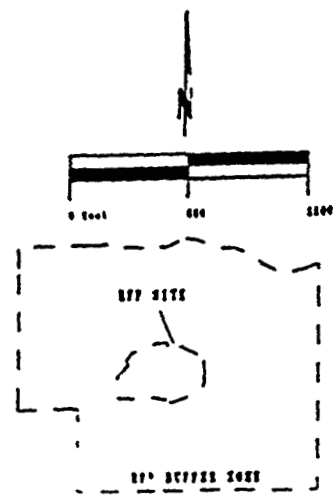


FIGURE 1 Location Map of Rocky Flats Plan



MAP LEGEND

- STREAMS, DITCHES, DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- SECURITY FENCE
- SURFACE WATER IMPOUNDMENTS
- BUILDING 122



BUILDING 122
MEDICAL FACILITY

FIG. 12

QUALITY ASSURANCE ADDENDUM

to the

ROCKY FLATS SITE-WIDE QA PROJECT PLAN

FOR CERCLA RI/FS AND RCRA RFI/CMS ACTIVITIES

for the

PLUTONIUM IN SOILS TREATABILITY STUDY

(OPERABLE UNIT NO. 2)

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

DRAFT

Title
Quality Assurance Addendum to the Rocky Flats Site-Wide QA Project Plan for CERCLA RI/FS and RCRA RFI/CMS Activities for the Plutonium In Soils Treatability Study

Approved By:

_____ __/__/__
Manager, Remediation Programs Date

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LIST OF ACRONYMS

CERCLA	Comprehensive Environmental Response Compensation and Liability Act
DOE	U S Department of Energy
DOT	U S Department of Transportation
DQO	Data Quality Objective
EM	Environmental Management
IAG	Interagency Agreement
LANL	Los Alamos National Laboratories
NTS	Nevada Test Site
0P	Operating Procedure
OU	Operable Unit
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
pCi/g	Picocuries per gram
QA	Quality Assurance
QAA	Quality Assurance Addendum
QAPjP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFP	Rocky Flats Plant
RPD	Remediation Programs Division
SOP	Standard Operating Procedure
STS Work Plan	Plutonium in Soil Treatability Studies Work Plan
TAL	Target Analyte List
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compounds

INTRODUCTION AND SCOPE

This Quality Assurance Addendum (QAA) supplements the "Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigation/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities" (QAPjP) The QAA establishes the specific Quality Assurance (QA) controls applicable to the field investigation activities described in the Plutonium in Soils Treatability Studies Work Plan (STS Work Plan)

The objective of the plutonium in soils treatability study is to evaluate the abilities of the TRUclean process and magnetic separation to reduce the concentration of plutonium and the levels of gross alpha/beta in Department of Energy (DOE) Rocky Flats Plant (RFP) soils to acceptable levels The treatability study, as described in the STS Work Plan, consists of collecting a bulk sample of plutonium-contaminated soils from the Operable Unit No 2 (OU-2) area, splitting this bulk sample into subsamples, and shipping the split samples offsite to conduct the TRUclean and magnetic separation studies The TRUclean process study will be conducted at the Nevada Test Site (NTS) by AWC-Lockheed The magnetic separation study will be conducted at Los Alamos National Laboratories (LANL)

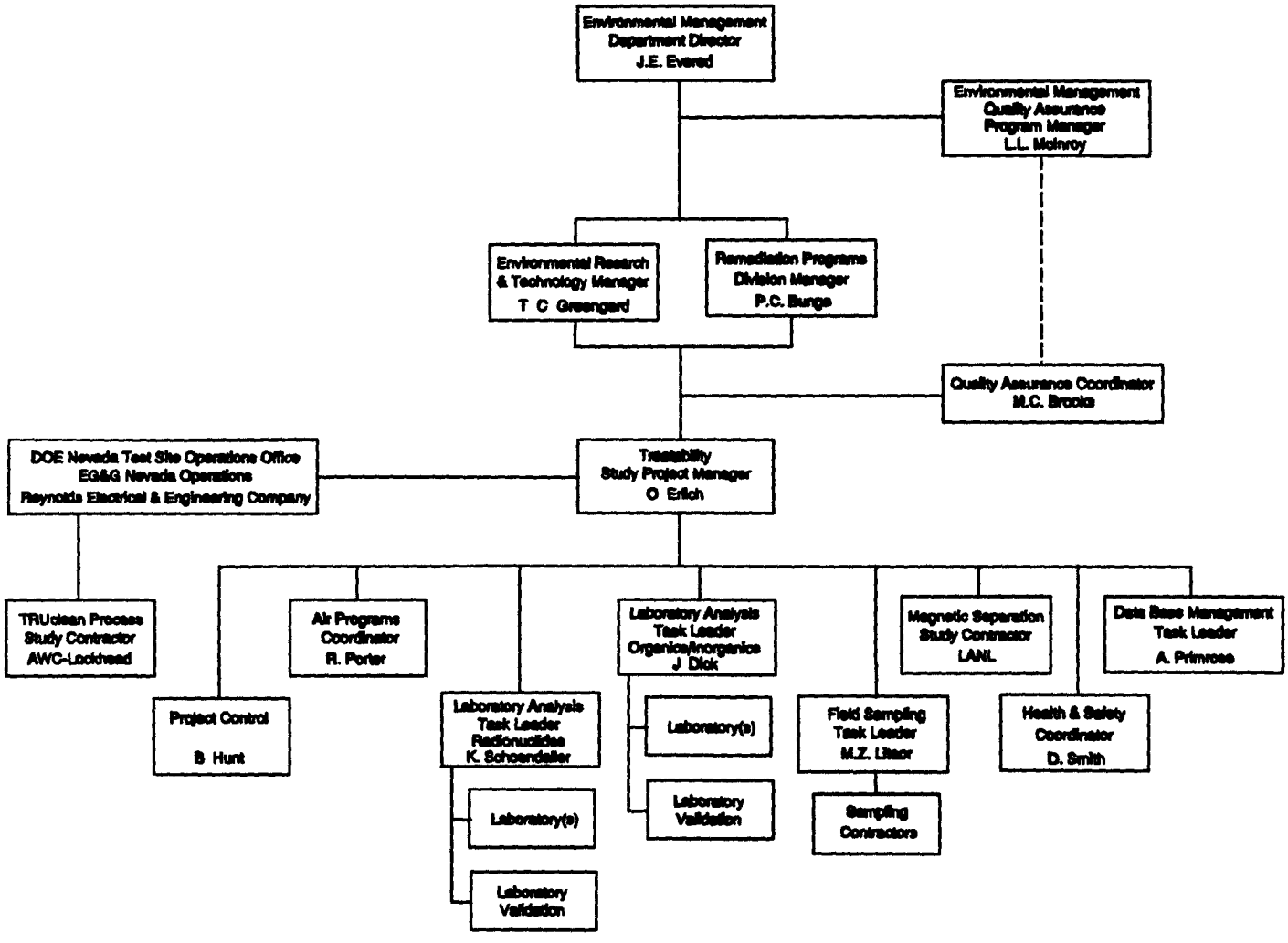
In order to evaluate the effectiveness of the TRUclean process and magnetic separation, pre-treatment and post-treatment soil samples will be characterized as described in the STS Work Plan This QAA addresses the quality assurance/quality control (QA/QC) requirements applicable to the collection of the bulk soil sample and analysis of the pre- and post-treatment samples

1.0 ORGANIZATION AND RESPONSIBILITIES

The overall organization of EG&G Rocky Flats and the Environmental Management (EM) divisions involved in environmental restoration activities is shown in Figures 1-1, 1-2, and 1-3 of Section 1 0 of the QAPjP Individual responsibilities are also described in Section 1 0 of the QAPjP

Contractors will be tasked by EG&G Rocky Flats to implement the field activities outlined in the STS Work Plan The specific EM Department personnel who will interface with the treatability study contractors and who will provide technical direction are shown here in Figure 1

Figure 1 Project Management for Sampling Plutonium in Soils Treatability Study



2.0 QUALITY ASSURANCE PROGRAM

The QAPjP was written to address QA controls and requirements for implementing Interagency Agreement (IAG) related activities As such, the controls and requirements addressed in the QAPjP are applicable to OU-2 plutonium in soils treatability study activities, unless specified otherwise in this QAA As a supplement to the QAPjP, this QAA addresses additional and site-specific QA controls and requirements that are applicable to the treatability study activities

2 1 Training

All EG&G Rocky Flats and contractor personnel involved in performing field activities at RFP shall complete the minimum training requirements specified in Section 2 0 of the QAPjP In addition, all personnel performing activities in accordance with the EM Department Operating Procedures (OPs), which are also referred to as Standard Operating Procedures (SOPs), specified in this QAA shall receive documented training on the QAPjP, this QAA, the applicable OPs, and any training specified in the OPs prior to performing the work

3.0 DESIGN CONTROL AND CONTROL OF SCIENTIFIC INVESTIGATIONS

The plutonium in soils treatability study shall be controlled by conducting the study in accordance with a documented work plan that is prepared, reviewed, and approved according to the requirements of Section 5 0 of the QAPjP The treatability study, including field sampling, sample preparation, treatment, and analysis of samples, shall be implemented according to documented, reviewed, and approved procedures

3 1 Design Control

The STS Work Plan is the design control plan for soil sampling and characterization activities The STS Work Plan specifies the objectives of the treatability tests, describes the TRUclean and magnetic separation processes, and discusses and/or references the proposed sampling procedures, treatability procedures, and analytical methodologies The STS Work Plan will be reviewed and approved by the Remedial Programs Division (RPD) Manager, or designee, prior to implementing the work described in the Work Plan Once the Work Plan has been reviewed and approved, any changes or revisions will also be reviewed and approved by the RPD Manager or designee

3 2 Data Quality Objectives

Data quality objectives (DQOs) quantitatively and qualitatively describe the uncertainty that decision makers are willing to accept in results derived from environmental data This uncertainty is used to specify the quality of the data required to meet the objectives of the investigations The process for developing DQOs for remedial investigations is summarized in Appendix A of the QAPjP An integral part of the DQO development process is defining the intended use(s) (or objectives) of the data, which in turn assists in determining the analytical level that is appropriate for the intended use Five analytical levels have been established for determining DQOs The analytical level determines the type of analysis or measurement needed to produce the data and the data quality controls and objectives for the data to satisfy the intended use(s) These levels (analytical levels I - V) are discussed in Appendix A of the QAPjP

3 2 1 Objectives

The objective of the treatability study is to evaluate the ability of the treatment process to reduce the level of radionuclide contamination, specifically gross alpha, gross beta, and plutonium 239 plus 240, in RFP soils to acceptable levels Soil cleanup goals for RFP have been established for these radionuclides based on human health and environmental risk assessment criteria and applicable regulatory requirements These cleanup goals and the cleanup objectives for this treatability study are 5 picocuries per gram (pCi/g) gross alpha, 10 Pci/g gross beta, and 0 9 pCi/g plutonium In addition to these cleanup goals, the clean soil produced from the treatment process should be a significant percentage of the total amount of soil treated The treatment objective for percentage of clean soil is 50 percent

Soil samples will be collected and analyzed prior to treatment in order to characterize the physical properties and the level of radionuclides of the bulk soil sample Representative samples of soil will be collected during and after initial treatment runs and analyzed by the treatment contractors Screening data produced from these analyses will be used to adjust the operations of the TRUclean and magnetic separation processes in order to obtain optimum operating conditions Post-treatment samples of clean soil will be collected following treatment runs at optimal operating conditions to determine if treatment objectives have been met

The pre- and post-treatment physical property and radionuclide contamination data should be of a known quality, since these data will be used to evaluate the effectiveness of the treatment According

to Table 5-1 of the STS Work Plan, analytical level IV data is appropriate for the pre- and post-treatment characterization data that will be used to evaluate treatment alternatives

The data that are used to adjust the process treatment operations is not critical for evaluating the effectiveness of the treatment and are considered screening data A quick turnaround time is needed for this data, with less rigorous QA/QC According to Table 5-1 of the STS Work Plan, analytical level II or III data are appropriate for this use

Measurements of precision, accuracy, representativeness, completeness, and comparability (PARCC parameters) are used to indicate data quality These parameters are defined and the method of calculation is presented in Appendix A of the QAPjP Based on the objectives of the analytical data discussed above, the following objectives for the PARCC parameter measurements are applicable to the data produced during this treatability study

3 2 2 Precision and Accuracy

Precision and accuracy objectives are dependent on the analyte of interest, the sample matrix, analytical method, and the quality control procedures that are applicable to the method of analysis Precision for a given analyte is measured the relative percent difference in concentration of the analyte between the sample and a duplicate sample, or between a spiked sample and a spiked duplicate sample Precision objectives for analytical level IV data are based on historical precision measures of the method of analysis or $\pm$ 35 percent relative percent difference if historical data are not available Precision objectives for the process operation screening data are not required

Accuracy is measured by the percent recovery of a known spike concentration added to a sample matrix Accuracy objectives for analytical level IV data are also based on historical objective measures of the method of analysis Where historical measures of accuracy are not available, the objective is 75 to 125 percent recovery This is also the accuracy objective for the process screening data

3 2 3 Completeness

Completeness is expressed as the percentage of valid or acceptable data points obtained from measurement or analysis The target goal for completeness for data packages is 100 percent, with a minimum acceptable of 90 percent

3 2 4 Comparability and Representativeness

Comparability and representativeness are qualitative parameters that are ensured through careful development of and adherence to the sampling and analysis plan, including establishing and following standard sampling and analytical procedures

3 3 Field Sampling Program and Sampling Procedures

The bulk soil sample that will be collected for conducting this treatability study will be taken from an area east of the 903 pad (OU-2) where plutonium concentrations are expected to be less than 10 pCi/g This bulk sample will be collected, composited, split, and containerized as described in the field sampling instruction for sampling plutonium-contaminated soils to support treatability tests at the NTS and LANL, which is presented in Attachment 1 of the STS Work Plan

Overall treatment optimization of RFP-contaminated soil by the TRUclean process will be achieved over four to six treatment runs The TRUclean process contractor (AWC-Lockheed) will collect representative samples of all process effluents as described in Section 7 of the STS Work Plan A sample of clean soil from the final process treatment run will be sent back to EG&G Rocky Flats for post-treatment analyses

EM Department Operating Procedures that are applicable to collecting plutonium-contaminated soil at OU-2 are listed in Table 1 The TRUclean process treatment procedures are included in the STS Work Plan as Attachment 2

3.4 Analytical Procedures

The analytical methods to be used to determine the chemical and physical soil parameters of interest are listed in Attachment A of this QAA Standard analytical procedures that are applicable to the

Table 1 EG&G Operating Procedures That Are Applicable to Collecting Plutonium-Contaminated Soils at OU-2

Former SOP Reference Number	New EMD OP Reference Number	Procedure Title
1 2	FO 02	Field Document Control
1 3	FO 03	General Equipment Decontamination
1 6	FO 06	Handling of Personal Protective Equipment
1 7	FO 07	Handling of Decontamination Water and Washwater
1 9	FO 09	Handling of Residual Samples
1 10	FO 10	Receiving, Labeling, and Handling Waste Containers
1 11	FO 11	Field Communications
1 12	FO 12	Decontamination Facility Operations
1 13	FO 13	Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples
1 15	FO 15	Use of PIDs and FIDs*
1 16	FO 16	Field Radiological Measurements*
NEW	FO 18	Environmental Sample Radioactivity Content Screening
3 8	GT 08	Surface Soil Sampling
New	TBD	Field Sampling Instruction for Sampling Plutonium-Contaminated Soils to Support Treatability Tests at NTS and LANL (See Attachment 1 of the STS Work Plan)

* As required by the Health & Safety Plan

analytical method to be used shall be adhered to by the laboratory(ies) conducting the analysis Analytical laboratories shall prepare sample handling, analysis, and documentation procedures and submit them to the EG&G Rocky Flats Laboratory Analysis Task Leader for review and approval prior to receiving samples for analysis, as required by Section 3 0 of the QAPjP and the EG&G Rocky Flats General Radiochemistry and Routine Analytical Services Protocol

3.5 Equipment Decontamination

Non-dedicated sampling equipment shall be decontaminated between samples in accordance with EG&G OP FO 03 (SOP 1 3) Decontamination water will be handled according to EG&G OP FO 07 (SOP 1 7)

3 6 Quality Control Checks

Duplicate samples will be collected from each of the bulk characterization samples and from the final treatment process run Duplicate samples shall be collected in the same manner as the analytical soil sample The volume of the duplicate samples shall be equal to that of the analytical samples An equipment rinsate blank shall be collected in the field prior to collecting each bulk composite sample The procedure for collecting the equipment rinsate blank is described in Section No 3 0 of the QAPjP

3 6 1 Objectives for the Field QC Samples

Equipment rinsate blanks are considered acceptable (with no need for data qualification) if the concentration of the analytes of interest is less than three times the required detection limit for each analyte as specified in Attachment A The duplicate sample analysis results should agree within 35 percent of the analytical sample Trip blanks and field blanks are not applicable to soil samples (see Section No 3 0 of the QAPjP)

3 6 2 Analytical Laboratory QC

Analytical laboratory QC procedures applicable to the method of analysis shall be used to ensure internal consistency of analytical and storage procedures Laboratory QC procedures shall include the use of replicate analysis and analysis of duplicate and matrix spike duplicates All laboratory analysis results, including results of QC sample analysis, will be forwarded to the EG&G Rocky Flats Laboratory Analysis Task Leader

3 7 Data Reduction, Validation, and Reporting

Analytical reporting turnaround times are as specified in Table 3-1 of the QAPjP

All analytical data shall be reviewed, evaluated, and verified by the laboratory contractor prior to submitting the data to the Laboratory Analysis Task Leader or data validation subcontractor, as appropriate The Laboratory Analysis Task Leader or validation contractor will validate the data as described in Section No 3 0 of the QAPjP The Laboratory Analysis Task Leader will then forward the validation results along with the entire data package for these samples to the EG&G Rocky Flats Treatability Study Project Manager and the Data Base Management Task Leader The Data Base Management Task Leader shall enter the data into the Rocky Flats Environmental Data System The Project Manager shall prepare a data report for this activity

4.0 PROCUREMENT DOCUMENT CONTROL

The treatability contractors (AWC-Lockheed and LANL) and the laboratory analytical contractors are required to adhere to the applicable requirements of the STS Work Plan, this QAA, and the QAPjP These contractors may be required to submit their own QA Program, which would meet the applicable requirements of the QAPjP and this QAA

5.0 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

The STS Work Plan describes the TRUclean and magnetic separation process, and the soil sampling and characterization activities to be performed The Work Plan shall be reviewed and approved by the RPD Manager prior to implementing these activities Any changes to the STS Work Plan after it has been approved shall be reviewed and approved in the same manner as the original Work Plan

The sampling and treatment operation procedures described in the Work Plan and the general operating procedures listed in Table 1 shall control the field and treatability study activities The analytical methods referenced in the Work Plan and in Attachment A of this document are the analytical procedures that shall control the analytical process The applicable data verification and validation procedures listed in Section No 3 0 of the QAPjP and referenced in Section 3 7 of this QAA shall control the data verification and validation process Any changes or revisions to these procedures that are necessary to complete the sampling and characterization process shall be documented by preparing a Procedure Change Notice

6 0 DOCUMENT CONTROL

The following documents will be controlled in accordance with Section No 6 of the QAPjP

"Plutonium in Soils Treatability Studies Work Plan, Rocky Flats Plant Operable Unit 2"

"RFP Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigation/Feasibility Study (RI/FS) and RCRA Facility Investigation/Corrective Measures (RFI/CMS) Studies Activities"

"Quality Assurance Addendum to the Rocky Flats Site-Wide QA Project Plan for CERCLA RI/FS and RCRA RFI/CMS Activities for the Plutonium in Soils Treatability Study"

Operating Procedures (i e , SOPs) specified in Table 1 of this QAA

7.0 CONTROL OF PURCHASED ITEMS AND SERVICES

Contractors that have been selected to perform the treatability study and laboratory analysis of soil samples shall be required to implement all requirements contained in the STS Work Plan, the QAPjP, this QAA, and applicable EG&G OPs listed in Table 1 Contractor performance shall be evaluated through the conduct of inspection, surveillances, and/or audits as described in Section 18 0 of the QAPjP

8.0 IDENTIFICATION AND CONTROL OF ITEMS, SAMPLES, AND DATA

8 1 Sample Containers

The sample container and volume requirements for the analytical soil samples (i e , the samples taken from the bulk composite soil sample for chemical and physical characterization and the VOC samples) and the duplicate samples are as follows

Analyte	Volume/Sample	Container
VOCs	2 X 120 mL	VOA vials
Semi-Volatiles	8 oz	wide-mouth glass jars

TAL Metals	8 oz	wide-mouth glass jars
Radionuclides	1 liter	wide-mouth glass jars

No preservatives will be used on soil samples VOC and semi-volatiles (SVOCs) samples will be cooled to approximately 4° C Holding times are 7 days for VOCs and SVOCs and 6 months for TAL metals Holding times are not applicable for radionuclides or physical analyses

Sample containers for shipment of bulk soil samples to NTS and LANL consist of 8-, 30-, and 55-gallon DOT 17H steel drums

8 2 Sample Identification

Samples shall be labeled and identified in accordance with Section No 8 0 of the QAPjP The project identifier will proceed the nine-character alpha numeric identifier described in the QAPjP, in order to identify this as a plutonium in soils treatability study soil sample This unique identifier shall consist of a "PC" that will proceed the regular nine-character identification number described in the QAPjP A typical soil sample number would be PC-SS00001XX, where

PC is the treatability study identifier
SS is the sample-type identifier (e g , SS for soil sample)
0001 is the first sequential soil sample collected
XX is the sampling contract ID

8 3 Chain-of-Custody

Sample chain-of-custody will be maintained through the application of OPS-FO 13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples (SOP 1 13)

9.0 CONTROL OF PROCESSES

The TRUclean and magnetic separation processes are described in Sections 6 and 7 of the STS Work Plan

10 0 INSPECTIONS

Inspections are not applicable to this activity (Note field and laboratory observations are not considered inspections, but are rather considered surveillances or audits)

11.0 TEST CONTROLS

The standard operating procedures for controlling the TRUclean process and magnetic separation process for this treatability study are included as Attachments 2 and 3 of the STS Work Plan

12.0 CONTROL OF MEASURING AND TEST EQUIPMENT (M&TE)

Field M&TE is not anticipated for use in this activity The laboratory equipment used to analyze environmental samples shall be calibrated, maintained, and controlled in accordance with the requirements contained in the specific analytical methods used and the instrument manufacturer's instructions

13.0 HANDLING, STORAGE, AND SHIPPING

Samples shall be packaged, transported, and stored in accordance with the requirements specified in Section 8 The soil samples shall be screened for radiation contamination in accordance with OPS-FO 18, Environmental Sample Radioactivity Content Screening (SOP 1 18) The radiation screening process is illustrated in Figure 8 2 of Section No 8 0 of the QAPjP The laboratory that will perform the physical analyses will accept samples only if radiation levels are less than 100 millicurie per sample

14 0 STATUS OF INSPECTION, TEST, AND OPERATIONS

The treatability contractors shall maintain and report the status of the process operations to the EG&G Rocky Flats Treatability Study Project Manager

15 0 CONTROL OF NONCONFORMANCES

The requirements for the identification, control, evaluation, and disposition of nonconforming items, samples, and data will be implemented as specified in Section No 15 0 of the QAPjP Nonconformances identified by the treatment and analytical contractors shall be submitted to the EM Department Quality Assurance Project Manager (QAPM) for processing as outlined in the QAPjP

16.0 CORRECTIVE ACTION

The requirements for the identification, documentation, and verification of corrective actions for conditions adverse to quality will be implemented as outlined in Section No 16 0 of the QAPjP Conditions adverse to quality that are identified by contractors shall be documented and submitted to the EM Department QAPM for processing as outlined in the QAPjP

17 0 QUALITY ASSURANCE RECORDS

Field sampling data records will be controlled in accordance with OPS-FO 02 (SOP 1 2), Field Document Control, and shall be considered QA records Laboratory chemical and physical analytical data packages shall also be considered QA records Other records associated with this activity that will be considered QA records include, but are not necessarily limited to, the following

- Chain-of-custody records
- STS Work Plan
- QAPjP/QAA
- Raw data results
- Audit/Surveillance reports
- Nonconformance reports
- Corrective Action reports
- Data validation results
- Procurement/contracting documentation

All QA records generated during the planning and implementation of this activity will be submitted to the EM Department Custodian (who reports to the Environmental Resource and Information Management Division Manager) for processing according to the EM Department QA records system described in Section No 17 0 of the QAPjP

18.0 QUALITY VERIFICATION

The requirements for the verification of quality shall be implemented as specified in Section No 18 0 of the QAPjP The EM Department QAPM shall develop a surveillance/audit schedule as deemed appropriate for this treatability study The surveillance will be scheduled to observe the TRUclean process and the gravimetric separation process A surveillance of the laboratory analysis will be

conducted at the discretion of the EG&G Laboratory Analysis Task Leader and the EG&G Project Manager for this activity A surveillance of the records produced from this activity will also be conducted

19.0 SOFTWARE VERIFICATION

The use of computer software during the conduct of this activity is not anticipated Therefore, the requirements of Section No 19 0 of the QAPjP are not applicable to this activity

Attachment A

Analytical Methods, Detection Limits
and Data Quality Objectives

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analyte	Method	Detection Limit	Precision Objective	Accuracy Objective
TAL Metals	EPA 6010[a]	1	**	***
TCL VOCs	EPA 8240[a]	1	**	***
TCL SVOCs	EPA 8250[a]	1	**	***
Radionuclides	2	1	**	***
Physical Analysis				
Particle Size	ASTM D-422	N/A	N/A	N/A
Specific Surface	Agronomy #9	N/A	N/A	N/A
Bulk Density	TDL 2110	N/A	N/A	N/A

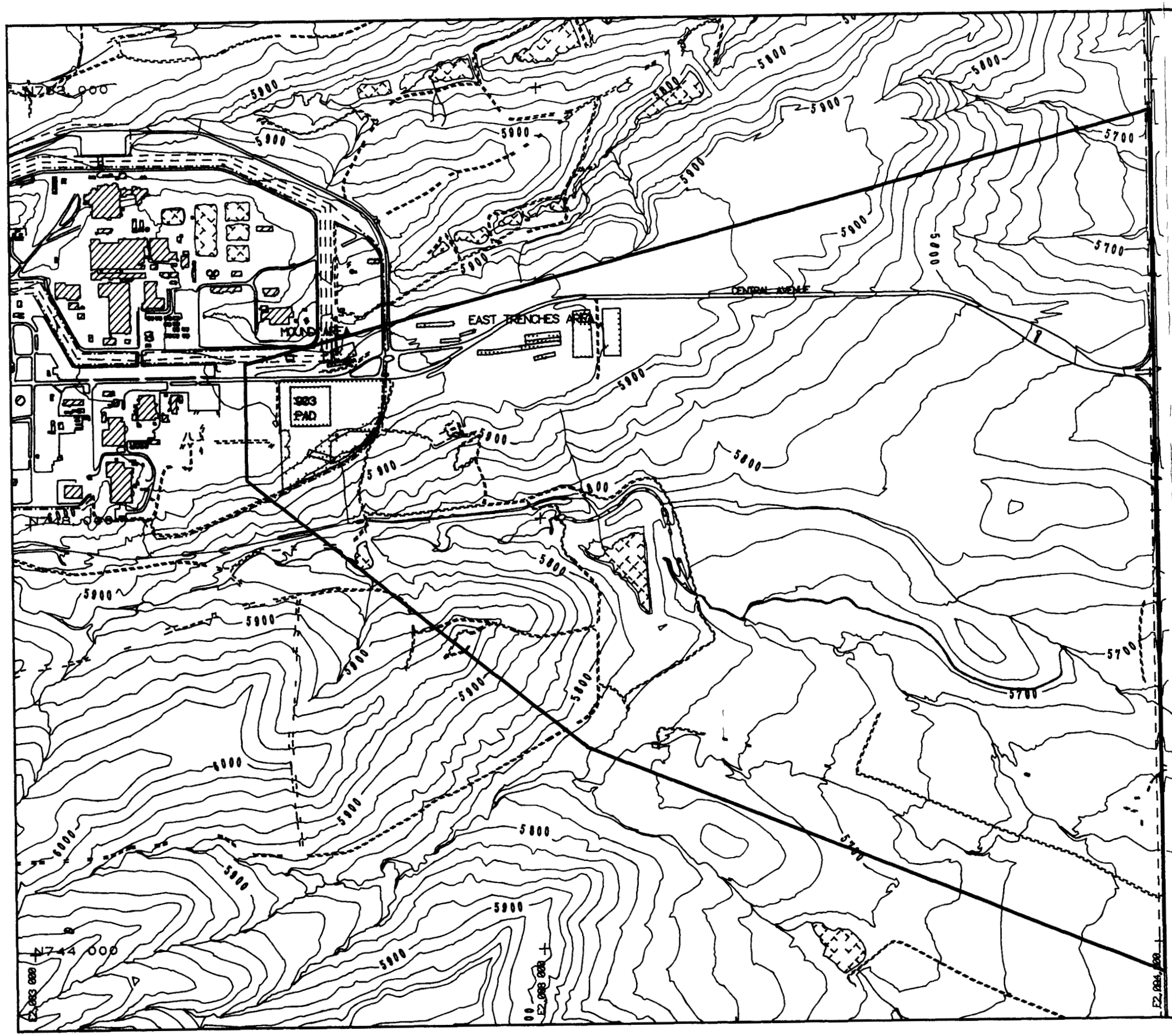
** Precision objective based on relative percent difference (see QAPjP Appendix A for equation) between sample and spiked duplicate Precision objective based on referenced method

*** Accuracy objective is based on the percent recovery of spiked duplicate (see Appendix A of the QAPjP) Accuracy objective based on referenced method

[a] "Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods" (SW-846, 3rd ED), U S Environmental Protection Agency

1 Detection limit will be based on practical quantitation limit, which is dependent on the specified method of analysis

2 The method of analysis has not yet been specified, but one of the methods listed in Appendix B of the QAPjP will be used



EXPLANATION

OPERABLE UNIT 2

STREAMS, DITCHES DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

SECURITY FENCE

SURFACE WATER IMPOUNDMENTS

BUILDINGS

INDIVIDUAL HAZARDOUS SUBSTANCE SITES

0 feet 1000 2000

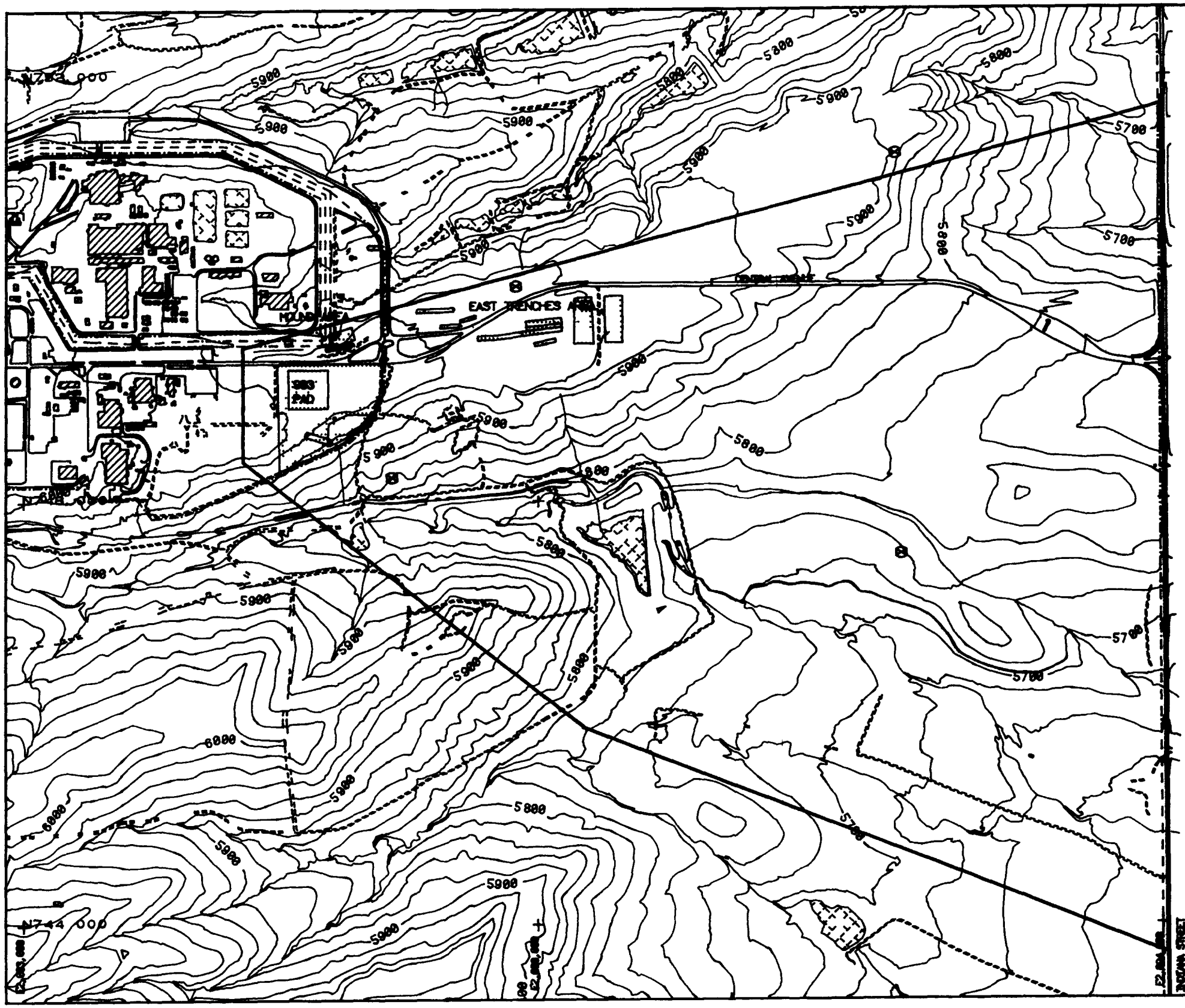
CONTOUR INTERVAL 20 FEET

U.S. DEPARTMENT of ENERGY
Rocky Flats Plant Golden, Colorado

OPERABLE UNIT 2

FIGURE 2

JULY 15 1991



EXPLANATION

- OPERABLE UNIT 2
- STREAMS, DITCHES DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- SECURITY FENCE
- SURFACE WATER IMPOUNDMENTS
- BUILDINGS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES
- SAMPLE LOCATION

N

0 feet 1000 2000

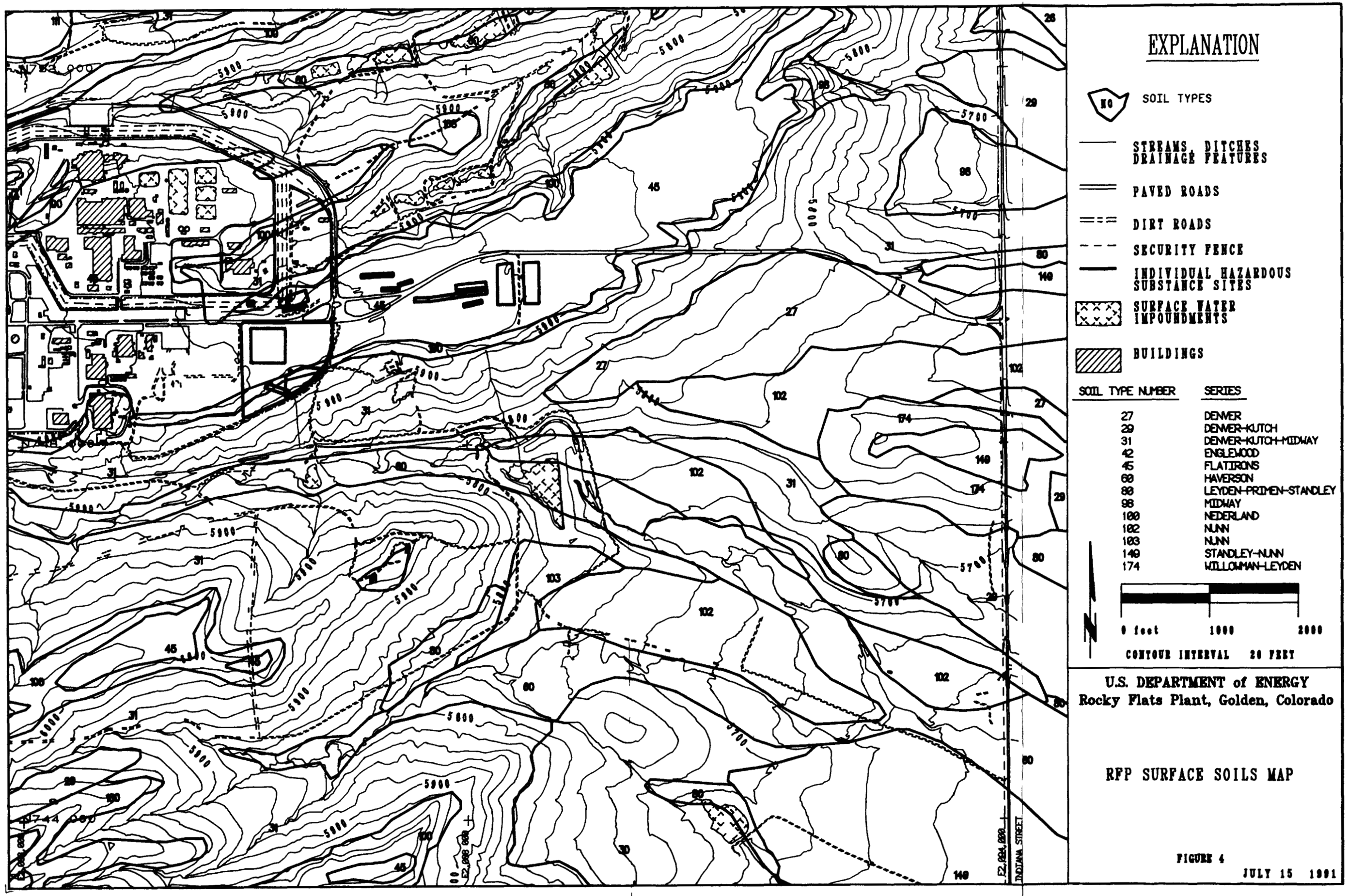
CONTOUR INTERVAL 20 FEET

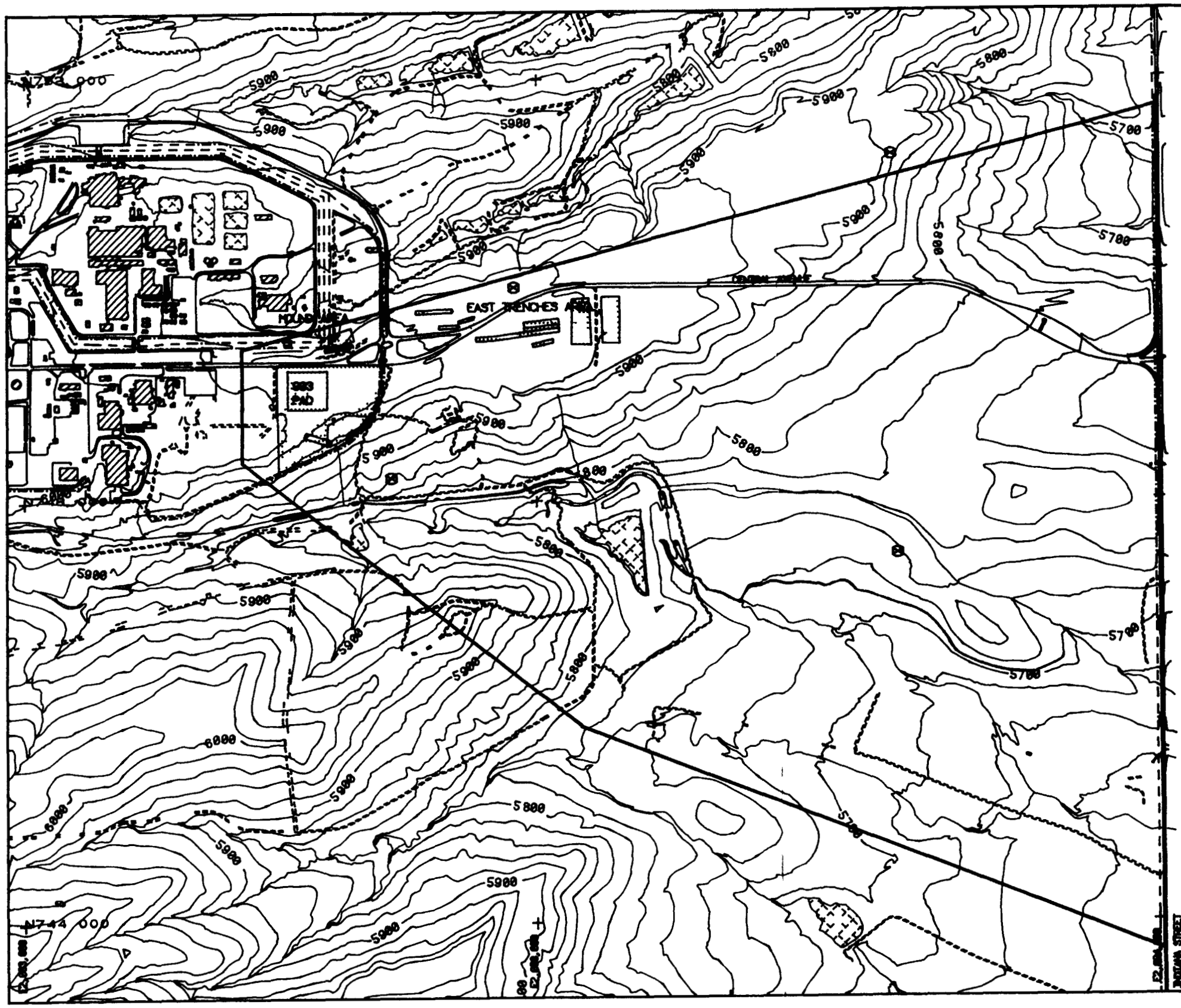
U.S. DEPARTMENT of ENERGY
Rocky Flats Plant, Golden, Colorado

SAMPLE LOCATIONS

FIGURE 3

JULY 15 1991


EXPLANATION
SOIL TYPES
STREAMS, DITCHES DRAINAGE FEATURES
PAVED ROADS
DIRT ROADS
SECURITY FENCE
INDIVIDUAL HAZARDOUS SUBSTANCE SITES
SURFACE WATER IMPOUNDMENTS
BUILDINGS
SOIL TYPE NUMBER
SERIES
27 DENVER
29 DENVER-KUTCH
31 DENVER-KUTCH-MIDWAY
42 ENGLEWOOD
45 FLATIRONS
60 HAVERSON
80 LEYDEN-PRIMEN-STANDLEY
98 MIDWAY
100 NEDERLAND
102 NUNN
103 NUNN
149 STANDLEY-NUNN
174 WILLOWMAN-LEYDEN
0 feet
1000
2000
CONTOUR INTERVAL 20 FEET
U.S. DEPARTMENT of ENERGY
Rocky Flats Plant, Golden, Colorado
RFP SURFACE SOILS MAP
FIGURE 4
JULY 15 1991
INDIANA STREET



EXPLANATION

- OPERABLE UNIT 2
- STREAMS, DITCHES DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- SECURITY FENCE
- SURFACE WATER IMPOUNDMENTS
- BUILDINGS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES
- SAMPLE LOCATION

N

0 feet 1000 2000

CONTOUR INTERVAL 20 FEET

U.S. DEPARTMENT of ENERGY
Rocky Flats Plant, Golden, Colorado

SAMPLE LOCATIONS

FIGURE 3

JULY 15 1991